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GUN DRILL
FOR
6-inch B.L. 26-cwt. Howitzer, Mark I,
CARRIAGE, MARK I.

ISSUED BY THE GENERAL STAFF.

(War pamphlet v. 135) May, 1920.



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G.M.

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GENERAL INSTRUCTIONS.

Practical instruction in the equipment should be given to each recruit before any attempt is made to instruct him in gun drill. This instruction should take the form of demonstrations dealing with the work of each number in the detachment; and all men under instruction should, in turn, carry out the work of each particular number.

Instruction in gun drill should begin as soon as they are conversant with all parts of the equipment, and can handle in the best and quickest manner each of the working parts of the gun. Once the work of each number has been thoroughly mastered, it should not take long for the recruit to learn the actual drill.

It is most important that a marked distinction should be drawn between instruction and drill.

During the former the language used should be as simple as possible, and the meaning of all technical terms which are necessary must be carefully explained. A conversational tone should be adopted and under no circumstances whatever should anything in the nature of long quotations from drill books be allowed. The men should be permitted to assume an easy attitude and their interest should not be allowed to flag. They should be encouraged to ask questions.

At drill, on the contrary, rigid discipline must be maintained, orders must be clear and decisive and the detachments made to work steadily, smartly and rapidly. At the same time the utmost accuracy is essential and any deviations from the methods laid down must at once be checked.

CHAPTER I.—GENERAL DUTIES.

This chapter summarizes the duties of each individual number in the detachment. It is only intended as a guide to the instructor, who should use his own words in explaining the various duties to the men.

The detachment is composed of ten numbers. The service of the gun is divided between them as follows:—

1	...	...	...	...	in command.
2	...	...	...	...	the breech.
1 and 3	...	...	...	...	the sights.
4 and 5	...	...	...	...	the trail.
6 and 10	...	...	...	...	the cartridges.
7, 8 and 9	...	...	...	...	the shell.

The duties of each individual number are as follows:—

No. 1.

1. He COMMANDS and is responsible for the entire service of his gun.

2. He gives the WORDS OF COMMAND detailed for him in chapter II, and repeats all ORDERS affecting his detachment which have not been heard by the numbers concerned. His orders must be given clearly, but no louder than is necessary to enable his detachment to hear.

He assists in passing orders down the battery when necessary.

He acknowledges orders by saluting. He must salute correctly, and face so that his salute can be clearly seen.

3. He is responsible :—

- (i) That the BUFFER is properly filled, that there is no leakage at the stuffing box, that the buffer is firmly nutted up to the lug of the gun, and the piston rod to the front cradle cap.
- (ii) That the RECUPERATOR is correctly charged with liquid and air, that there is no leakage at the stuffing box or rear end of the liquid cylinder, and that the ram is nutted up to the front cradle cap.
- (iii) That the ACTUATING GEAR of the piston rod is properly assembled.
- (iv) That the SIGHTS are tested. This is done under the supervision of the section commander.
- (v) That the wooden STOP for the quick elevating gear is in its place, except when elevations below the loading position ($7\frac{1}{2}$ degrees on level ground) are required, either for testing equipment or for firing at short ranges. In the latter case the lever of the quick elevating gear must be jammed with a piece of wood to prevent the loading plunger engaging.

4. At preparation for action he places the WATKIN CLINOMETER over his right shoulder, and procures the buffer and recuperator SPANNERS and a piece of CHALK.

5. On coming into action he procures the ADAPTER and PRESSURE GAUGE.

6. The GUN PLATFORM should be on firm and level ground. If this cannot be found and time permits, the higher wheel is dug in. Failing this he orders 3 to adjust

the traversing gear so that the breech is about two degrees towards the higher wheel.

7. As soon as the gun is in action he ascertains the lowest elevation at which the trajectory will **CLEAR THE CREST**. He reports this elevation to the section commander.

8. He selects the auxiliary aiming point and records in chalk on the chase the **ZERO LINE** angles from the auxiliary aiming point and battery picket.

9. Before the gun is laid on a **NEW TARGET** he gauges the line of fire, and directs the gun into the line, ordering 4 and 5 to move the trail. One foot at the trail-eye corresponds to 5 degrees of traverse.

10. (i) At **INDIRECT LAYING** with **SIGHT CLINOMETER**, he lays for elevation. He sets on the sight clinometer the angle of sight and position correction ordered. He orders the gun deflection (if any) and sets on the sight clinometer the gun correction for the elevation ordered. He lays by bringing the bubble of the sight clinometer to the centre of its run.

(ii) At **INDIRECT LAYING** with **WATKIN CLINOMETER**, he applies the index correction (if any) of his clinometer to the elevation ordered, sets the clinometer, and directs 3 to elevate and depress until the bubble of the Watkin clinometer is in the centre of its run.

(iii) At **DIRECT LAYING** he levels the sight clinometer by means of the micrometer head as soon as 3 has laid the gun.

11. (i) When **SETTING** the **SIGHT CLINOMETER** he turns the top of the micrometer head towards himself last, to take up backlash.
- (ii) When **SETTING** the **ELEVATION INDICATOR** he turns the top of the elevation indicator hand-wheel towards himself last.
- (iii) When using the **WATKIN CLINOMETER** he sees that the clinometer plane and the base of the clinometer are free from grit or dirt, and that the clinometer is placed exactly in the same position on the plane for each lay.
- (iv) When **LAYING** he depresses last (top of the hand-wheel towards himself) with at least two complete turns of the handwheel. If the bubble of the clinometer over-runs the centre he rapidly gives the elevating wheel two complete turns of elevation followed by $1\frac{1}{2}$ turns of depression before completing the lay.

12. He supervises the preparation and supply of **AMMUNITION**. As time fuzes deteriorate rapidly when unprotected from damp, only such as are required for immediate use will be uncovered. When one group of ammunition is nearly expended, he reports particulars of the next group to be used.

13. He supervises **LOADING**.

The shell should be rammed home vigorously with a good travel. The sound of the driving band engaging the rifling should be distinctly heard. Irregularity in ramming causes irregular shooting, especially when the gun is worn. An improperly rammed shell may slip back when the gun is elevated and cause a premature.

He sees that the correct charge is loaded.

14. He gives the order to FIRE. The gun will on no account be fired without his order. Before giving this order he sees that the red lines on the breech and breech screw coincide, showing that the breech is properly closed, that the firing plunger of the quick elevating gear is properly engaged, and that the gun is in all respects ready.

15. He is responsible that the INTERVAL between rounds is properly kept as regards his own gun. When a salvo or quick rate of battery fire (less than 5 seconds interval) is ordered, he extends his right arm above his head as soon as his gun is ready to fire.

16. At intervals he checks the LENGTH OF RECOIL. He compares the elevation given by the recoil indicator with the elevation on the brass elevation arc situated below the sight.

17. He watches the action of the SPADE on recoil and adjusts its support if necessary.

18. As soon as his gun has fired he gives the order to LOAD if the battery commander's orders indicate that this is his intention.

19. When RAPID or PROLONGED FIRING takes place he takes every opportunity of attending to his equipment. The chamber, mushroom head and breech block should constantly be sponged with water. If the gun is hot the bore should be cooled with water when "Stand easy" is ordered.

No. 2.

1. He works the QUICK ELEVATING GEAR and BREECH MECHANISM and FIRES the gun. He is responsible for the breech and muzzle COVERS. With 5 he tests and adjusts the OBTURATING PAD.

2. At preparation for action :—

- (i) He straps the TUBE POCKET round his waist and fills it with tubes.
- (ii) He places the LANYARD round his neck and tucks the ends into his belt.
- (iii) He sees that the VENT BIT, RIMER and OIL CAN are in the pockets on the right trail-arm.
- (iv) He procures the breech mechanism WRENCHES.

3. (i) To bring the gun to the LOADING POSITION ($7\frac{1}{2}$ degrees elevation) he releases the quick elevating gear by lifting the lever, places both hands on the cradle slide and allows the breech to come up gently until the loading plunger is engaged.

(ii) To bring the gun to the FIRING POSITION he releases the quick elevating gear by bearing down on the lever, grasps the cradle slide with both hands and lowers the breech gently until the firing plunger is engaged.

4. (i) To OPEN the BREECH:—He takes hold of the lever breech mechanism with the left hand, thumb uppermost, and slides the hand down so as to press down the catch retaining, at the same time pulling the lever to the rear and then swinging it round to the right as far as it will go.

(ii) To CLOSE the BREECH:—The above procedure is reversed. The breech must on no account be slammed.

5. At the order "READY," he passes the loop of the firing wedge over the striker cap and pulls it towards him until the cap passes the projections on the wedge. He steps clear of the wheel and stands facing the front. He holds the toggle in his right hand and grasps the centre of the lanyard with his left hand.

6. At the order "FIRE" he jerks the lanyard smartly. The gun will on no account be fired without the order from 1.

7. He oils and cleans the BREECH MECHANISM when necessary during firing.

No. 3.

1. He LAYS and is responsible for the SIGHT COVER. He directs 6 when planting AIMING POSTS. He assists 1 to test the SIGHTS.

2. At preparation for action he procures a piece of CHALK.

3. On coming into action he places the No. 7 DIAL SIGHT and carrier and the SIGHT CLINOMETER in their brackets.

4. (i) He always LAYS for LINE. He sets on the dial sight the aiming point angle and all deflections ordered, and CROSS LEVELS the sight. He lays on the left edge of the aiming point unless otherwise ordered.

(ii) At INDIRECT LAYING with WATKIN CLINOMETER he sets the elevation indicator at the

elevation ordered and elevates and depresses under the orders of 1.

(iii) At DIRECT LAYING he lays both for line and for elevation over the open sights.

5. (i) When setting the dial sight by means of the QUICK RELEASE he moves the micrometer head through one complete turn to ensure that the teeth have re-engaged correctly.

(ii) When SETTING a right deflection on the dial sight he turns the right micrometer head away from him with his right hand; when setting a left deflection he turns the left micrometer head towards himself with his left hand.

(iii) When READING a left angle on the dial plate he reads the minutes off the left micrometer scale; when reading a right angle he reads the minutes off the right micrometer scale.

(iv) When LAYING for LINE he turns the top of the traversing handwheel towards himself last.

6. For the first round, the pointer of the TRAVERSING GEAR must be within 30 minutes of zero when the lay is completed, except when engaging G.F. or similar targets.

7. CROSSHEADS are fitted to aiming posts to compensate for lateral movement of the sight. Both crossheads have similar markings and numbers. He notes which corresponding pair of markings are in line and uses them to lay on. He directs 6 to clamp the crossheads low down, so that the bottom of the far one is just visible over the top of the near one.

8. He records in chalk on the breech the PRESENT TARGET angle from the auxiliary aiming point, battery picket, or aiming posts.

9. The following are the signals used by 3 :—

SIGNAL.	MEANING.
(i) When directing 4 and 5 to move the trail :—	
Palm of the hand in the required direction.	Trail right (or left).
Fist clenched 	Stop traversing.
Smart tap on the thigh with the palm of the hand.	Take post.
(ii) When directing 6 to plant aiming posts :—	
Right arm extended to the right or left arm extended to the left.	Move in the direction indicated.
Arm dropped 	Halt.
Both arms dropped sharply from above the head.	Plant.
Upward or downward motion of the arms with both arms extended laterally.	Raise or lower the crosshead.
Both arms extended above the head and moved laterally in the required direction.	Move head of post in the direction indicated.
Both arms extended sharply upwards.	Pick up.
Both arms extended to the front.	Move to plant the far aiming post.
Body turned about and both arms extended to the rear.	Come in.

No. 4.

1. He attends to the right BRAKE and fixes DRAGROPES to the right wheel. He assists 5 to LIFT and TRAVERSE the trail and to RAM.

2. At preparation for action he procures a McMahon SPANNER.

3. On coming into action he places :—

(i) His HANDSPIKE, bevel up, and iron-shod LEVER on the right of the carriage, one yard clear and head in line with the front of the wheel.

(ii) The LOADING TRAY on the trail.

4. He puts on the right BRAKE as soon as the gun is laid in the line of fire.

5. He takes post on the RAMMER facing the rear, with his right foot inside the trail arm and his left foot against the rear pump bracket. He bends forward from the hips and grasps the butt of the rammer with his right hand back up and his left hand back down.

No. 5.

1. He attends to the left BRAKE and fixes DRAGROPES to the left wheel. He assists 4 to LIFT and TRAVERSE the trail and to RAM.

2. He is responsible for the BREECH and CHAMBER, and assists 2 to test and adjust the OBTURATING PAD.

3. At preparation for action he puts a FUZE KEY in his pocket, placing the lanyard round his neck.

On coming into action he places :—

- (i) His HANDSPIKE, bevel up, and iron-shod LEVER on the left of the carriage, one yard clear and head in line with the front of the wheel.
 - (ii) The RAMMER on the left of the trail, head in line with the centre of the trail and about one yard clear.
 - (iii) TALLOW and WASTE on the left of the carriage.
5. He puts on the left BRAKE as soon as the gun is laid in the line of fire.
 6. He UNCAPS FUZES. On removing the cap of a No. 106 fuze he sees that the tape is correctly wound and that the ends of the shearing wire are visible.
 7. He PUSHES THE SHELL into the chamber with the palm of his right hand until the base is flush with the face of the breech.
 8. He picks up the RAMMER with his right hand, passes the head under his right arm and places it against the base of the shell. (At drill he places it against the face of the breech.) He replaces the rammer in the same way.
 9. He takes post on the RAMMER facing the rear, with his left foot inside the trail arm and his right foot against the rear pump bracket. He bends forward from the hips and grasps the butt of the rammer with his left hand back up and his right hand back down.

No. 6.

1. He provides DRAGROPES and does any DIGGING required in the service of the gun. He plants AIMING POSTS and LOADS CARTRIDGES.

2. On coming into action he places :—

- (i) PICK and SHOVEL on the right of the carriage and 3 yards clear.
- (ii) DRAGROPE, folded, in rear of the pick and shovel.
- (iii) AIMING POSTS, with crossheads clamped, outside 4's iron shod lever, heads to the front.

3. He assists 10 to prepare CARTRIDGES, carries them to the gun and loads them from the left side. He holds the cartridge with the charge number upwards for 1 to check, but in wet weather he must keep the igniter dry. He places the cartridge in the chamber so that the igniter faces the vent and is just clear of the mushroom head. If the cartridge is thrown to the front of the chamber, either by 6 or by the closing of the breech screw, a missfire may occur.

No. 7.

1. He provides DRAGROPES and does any DIGGING required in the service of the gun. He prepares and carries SHELL.

2. On coming into action he places :—

- (i) PICK and SHOVEL on the left of the carriage and 3 yards clear.
- (ii) DRAGROPE, folded, in rear of the pick and shovel.

3. He assists 8 and 9 to prepare SHELL and carries shell to the gun alternately with 8. He places the shell across the tray, turns it fuze to the front until it drops into the tray and slides it to the rear.

No. 8.

1. He prepares and carries SHELL.
2. At preparation for action he puts a FUZE KEY into his pocket and places the lanyard round his neck.
3. He assists 7 and 9 to prepare SHELL and carries shell to the gun alternately with 7. He places the shell across the tray, turns it fuze to the front until it drops into the tray and slides it to the rear.

No. 9.

1. He is responsible for the preparation and supply of TUBES and SHELL.
2. At preparation for action :—
 - (i) He puts a FUZE KEY into his pocket and places the lanyard round his neck.
 - (ii) He procures a BRUSH, HAMMER and FILE.
3. He sees that shell are :—
 - (i) Scrupulously CLEAN, especially the driving bands. Brushes and water should be used if necessary.
 - (ii) SORTED into groups by nature, driving band and weight.
 - (iii) STORED standing up on clean planks.
 - (iv) FUZED as ordered and protected from damp.
 - (v) ISSUED from the group ordered.
4. When using No. 106 fuzes :—
 - (i) He BREAKS the wire and seal on issuing the round.

- (ii) He DISCARDS any fuze of which the wire and seal are already broken, or the cap deficient, and sees that on no account is it replaced in limber, wagon, or lorry.

5. When one group of shell is nearly expended, he REPORTS to 1 the particulars of the next group.

NO. 10 OR COVERER.

1. He is SECOND IN COMMAND of the detachment and is responsible for the preparation and supply of CARTRIDGES.

2. At preparation for action he procures a SCREW DRIVER.

3. He sees that cartridges are:—

- (i) SORTED by nature of propellant and "group" number.
- (ii) STORED in boxes and protected from extremes of temperature and from damp.
- (iii) PREPARED correctly; all sections bearing a higher number than the charge ordered are removed.
- (iv) ISSUED from the group ordered.

4. When one group of cartridges is nearly expended, he REPORTS to 1 the particulars of the next group.

CHAPTER II.—GUN DRILL.

Artillery Training lays down the principles of battery tactics, which vary little with different equipments. This chapter details the orders given and the procedure by which these orders are carried out in batteries armed with the 6-in. 26-cwt. B.L. Howitzer.

The wording must be memorized and strictly adhered to, with the exception of sections 30 and 31.

The executive order is shown throughout as being given by the section commander, as will normally be the case during training. When orders can be heard throughout the battery they will be acted upon without repetition. Instructors will invariably employ the orders detailed for the section commander, even when drilling a single detachment.

1. POSITIONS AT DETACHMENT REAR.

The detachment falls in two deep, one pace between ranks, 1 on the right and 10 on the left of the front rank. 1 and 10 are not covered.

When the gun is limbered up, the front rank is three paces in rear of the muzzle, 1 covering the off gun wheel.

When the gun is in action, the front rank is one pace in rear of the trail eye, 1 covering the right gun wheel.

2. TO TELL OFF.

Section commander.

"...section—Tell off."

1 numbers himself 1, the right hand man of the rear rank 2, his front rank man 3 and so on.

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3. TO CHANGE ROUND.

Section commander.

"...section—*Change round.*"

1 takes a pace to the rear with his right foot and a pace to the left with his left. The left hand man of the rear rank takes a pace to the left with his left foot and a pace to the front with his right. At the same time the remainder of the front rank take a pace to the right and the rear rank a pace to the left.

(The detachment is then again told off.)

4. TO MOVE THE GUN WITH DRAGROPES WHEN LIMBERED UP.

Section commander.

"...section—*With dragropes, prepare to advance.*"

6 and 7 hand the dragropes to 4 and 5; 4 and 5 hook them to the dragwashers on their own sides, the backs of the hooks downwards; 8, 9 and 10 go to the drawbar of the limber or the limber pole; the remainder man the ropes, even numbers on the near side, odd numbers on the off.

At the order "Walk march" the carriage is moved to the front.

At the order "Halt" the carriage is halted and the detachment remain at their posts.

At the order "Detachments rear," 4 and 5 unhook the dragropes, 6 and 7 replace them; the detachment double to their places and halt.

5. TO PREPARE FOR ACTION.

Preparation for action will be carried out before leaving the gun park or moving into action. When in action, advantage should be taken of any interval to examine, test and arrange equipment.

Section commander.

"...section—Prepare for action."

Each number procures the small stores detailed in chapter I, and checks the other stores for which he is responsible. **1** then orders "Unlimber."

1 tests the clinometer and the elevation indicator, sees that the bore is clear, the buffer full and the air pressure correct, and satisfies himself that the detachment and equipment are in all respects ready for action.

2 removes the breech and muzzle covers, examines the breech mechanism and tests the quick elevating gear. He replaces the breech and muzzle covers if ordered.

3 removes the sight cover, and examines and tests the sights with the assistance of **1**. He then examines the elevating and traversing gears. He replaces the sight cover if ordered.

4 and **5** remove the cradle clamp.

5 examines the chamber and threads of the breech.

6, 7, 8, 9 and **10** examine and prepare ammunition if ordered.

As soon as preparation for action is completed, **1** collects reports and orders "Limber up." The detachment forms detachment rear and **1** reports to his section commander "No. ..., ready for action" or otherwise.

TO COME INTO ACTION.

Action rear.

Section commander.

"...section--Action rear."

1 places himself dismounted so that he can see when his gun is in the required position. He then orders "Halt—Action rear."

4 and 5 go to the trail, 6 and 7 to the limber hook; 7 unkeys.

1 orders "Lift" and the trail is lifted clear of the hook.

1 orders "Limber drive on" and the limber moves clear, "Lower" and the trail is lowered to the ground.

(If the gun is being manhandled, 8, 9 and 10 go to the drawbar of the limber or the limber pole and with 6 and 7 move the limber clear.)

The limber advances five yards, halts for stores to be removed and proceeds to the wagon line under the direction of the battery serjeant-major.

As soon as the gun is in position, 4 and 5 remove the keys securing cradle clamp; 2 brings the gun to the loading position; 4 removes the cradle clamp and places it clear.

The stores are placed in position by the numbers responsible for them.

The numbers take up their positions in action.

Action right, Action left, Action front.

As soon as the trail has been lowered to the ground 6 makes fast a dragrope to the trail eye and the trail is moved in the required direction.

7. POSITIONS IN ACTION.

- 1 where he can best superintend the work of the detachment.
- 2 on the right of the gun, close to the breech, facing the front.
- 3 on the left of the gun, in rear of the dial sight, facing the front.
- 4 on the right of the gun, in line with the front pump brackets, one yard clear and facing the trail.
- 5 on the left of the gun facing 4.
- 6 and 10 with the cartridges.
- 7, 8 and 9 with the shell.

8. TO FORM DETACHMENT REAR IN ACTION.

Section commander.

"...section—*Detachments rear.*"

1 doubles to his place (one yard in rear of the trail eye and covering the right gun wheel) and gives the order "No., double march."

At the order from 1 the remainder double to their places and halt.

9. TO TAKE POST FROM DETACHMENT REAR.

Section commander.

"...section—*Take post.*"

The detachment double to their places by the shortest way and halt.

10. TO OBTAIN THE LINE OF FIRE.

The line of fire is obtained by one of the methods described in Artillery Training.

11. TO LAY THE GUN IN THE LINE OF FIRE.

Section commander.

"...section—Aiming point ..., ... degs. ... mins. right (or left)."

1 orders "Take post to lay"; 4 and 5 pick up the iron shod levers and fit them into the brackets on the trail.

1 sets the elevation indicator at 20 degrees and the sight clinometer at zero, and brings the bubble to the centre of its run by the elevating handwheel.

2 closes the breech and brings the gun to the firing position.

3 sets the dial sight and lays roughly on the aiming point, directing 4 and 5 to move the trail.

3 gives the signal "Take post." 4 and 5 replace the iron shod levers and put on the brakes.

3 brings the cross level bubble approximately to the centre of its run and lays accurately for line with the traversing gear.

3 reports to 1 the readings of the dial sight from the battery picket and auxiliary aiming point; 1 records them on the chase.

2 brings the gun to the loading position and opens the breech.

The section commander goes to his guns and takes a note of the angles recorded.

If necessary on account of heavy ground, 1 orders "With dragrope, trail right (or left)." 6 (or 7) hooks a dragrope to

the trail eye; all numbers except 1 and 3 man the rope and heave as directed by 1.

At the order "Take post to lay" 4 and 5 man the levers, 6 (or 7) replaces the dragrope and the remainder resume their posts.

12. TO ASCERTAIN THE LOWEST ELEVATION AT WHICH THE TRAJECTORY WILL CLEAR THE CREST.

When the crest is within 100 yards of the gun.

The angle of sight to the crest is the elevation required.

1 lays the gun just clear of the crest by looking along the bottom of the bore and ordering 3 to elevate or depress as required. He then sets the sight clinometer at zero, brings the bubble to the centre of its run by turning the elevation indicator handwheel, and reports the reading of the elevation indicator to the section commander.

When the crest is over 100 yards from the gun.

The procedure is the same but an allowance is made for the elevation due to the range to the crest.

1 proceeds as before. The section commander makes a liberal estimate of the range to the crest and adds the elevation for this range (with first charge unless otherwise ordered) to the elevation reported by 1.

13. TO PLANT AIMING POSTS.

Section commander.

"...section—Aiming posts front (or rear)."

2 closes the breech and brings the gun to the firing position.

6 doubles to the front (or rear) of his gun with two aiming posts and plants them as directed by 3 in line with the dial sight set at zero (or 180 degrees). He plants the near post first at about 50 yards from the gun. He then plants the further post as far from the gun as possible up to about 100 yards.

2 returns the gun to the loading position.

If the order "Replant aiming posts" is given, 6 doubles out and, at the signal from 3, pulls up the posts, the further one first, and replants them.

14. PARALLEL LINES TO A NAMED GUN.

Section commander.

"...section (or No. ...)—Parallel lines to No. ...".

3 of the named gun re-lays for line, all guns being roughly laid at 20 degrees.

Zero line method.

1 of the named gun reports his angle right or left of his zero line. This angle is ordered to the other guns.

Aiming point method.

The section commander indicates an aiming point.

3 of the named gun swings his dial sight on to the aiming point and 1 reports the reading. This angle, corrected if necessary for parallelism, is ordered to the other guns.

Director method.

3 of the named gun swings his dial sight on to the director and 1 reports the reading. The director is set accordingly and individual angles are ordered to the other guns.

The other guns are then laid in the line of fire as already detailed.

15. TO CHECK PARALLEL LINES.

Section commander.

"...section—*Check parallel lines to No. ...*"

1 sets the elevation indicator at 20 degrees and brings the bubble to the centre of its run.

2 closes the breech and brings the gun to the firing position.

3 of the named gun lays on the dial sight of each gun in turn.

1 reports the angles to his section commander, who passes them to the section commanders concerned.

3 of each other gun lays on the dial sight of the named gun.

1 reports the reading to his section commander, who checks it with the angle taken by the named gun. The sum of the two angles should be 180 degrees. If necessary, he corrects the zero line angles.

16. TO LOAD.

Section commander.

"...section—(*shell*)..., (*fuze*)..., (*propellant*)..., *Charge*..."

1 repeats this order and at the correct moment orders "Load."

9 issues a shell to 7 (or 8) who carries it to the gun and places it on the loading tray; 5 uncaps the fuze (if necessary);

4 and 5 lift the loading tray on to the cradle slides; 5 pushes the shell into the chamber and picks up the rammer.

4 and 5 take post on the rammer; 2 and 3 steady the breech carrier and loading tray.

1 orders "Home"; 4 and 5 ram home; 5 replaces the rammer.

4 and 5 replace the loading tray on the trail clear of the line of recoil. (Until the spade is engaged 4 holds the tray in front of him.)

10 issues a cartridge to 6; 6 shows it to 1, places it in the chamber and reports "In."

2 closes the breech, brings the gun to the firing position, places a tube in the vent and closes the lock.

After the first round, if there is no alteration in ammunition 1 orders "Load," repeating also any change in ammunition which may be ordered. The cartridge will not be loaded sooner than is necessary to maintain the rate of fire.

NOTE.—At drill only wooden shell and drill cartridges will be loaded.

17. TO LAY THE GUN.

Indirect laying with sight clinometer.

Section commander.

"... section — ... degs. ... mins. more right (or left),"

"Angle of sight ... degs. ... mins. elevation (or depression),"

"No. ... — add (or drop) ... degs. ... mins.,"

"(elevation) ... degs. ... mins."

3 puts on the deflection.

1 puts on the angle of sight and position correction (if any), sets the elevation indicator, looks up the gun correction and sets it on the sight clinometer.

1 elevates until the bubble of the sight clinometer runs to the front, depresses until the bubble is nearly in the centre of its run and reports "On" to 3.

3 cross levels, lays for line and stands clear.
1 completes the lay for elevation.

Indirect laying with Watkin clinometer.

Section commander.

"... section—Clinometer laying."
 "... degs. ... mins. more right (or left)," *"*
 "(elevation) ... degs. ... mins."*"*

3 puts on the deflection and sets the elevation indicator.

1 applies the index correction (if any) to the elevation ordered and sets the clinometer.

3 elevates and depresses under the orders of **1** until the bubble is nearly in the centre of its run. **1** reports "On" to **3**.

3 cross levels, lays for line and reports "On" to **1**.

3 depresses steadily until **1** reports "On" a second time.

NOTE.—When laying with Watkin clinometer, the elevation ordered is the actual elevation at which each gun is to be laid.

Direct laying.

Section commander.

"... section—Reference point ..., Target ...,"
 "Open sights, ... degs. ... mins. more right (or left)," *"*
 "(elevation) ... degs. ... mins."*"*

1 orders "Take post to lay" and directs the gun into the line.

1 sets the elevation indicator. **3** sets the traversing gear at zero (or at 3 degrees traverse if the order "Target moving from ... to ..." is given) and puts the deflection on the open sights

3 lays roughly, directing **4** and **5** to move the trail and gives the signal "Take post." He then cross-levels and lays direct over the open sights on the ground line of his portion of the target.

As soon as the gun is laid, **1** levels the sight clinometer by means of the micrometer head, thus taking the angle of sight.

If "Indirect laying" is ordered, **3** picks up an auxiliary aiming point with the dial sight. Unless a new angle of sight is ordered, **1** uses the angle of sight already taken.

18. TO FIRE.

No. 1

"No. ... — Ready."

"No. ... — Fire."

1 orders "Ready" when he has satisfied himself that his gun is ready and shortly before it is his turn to fire.

(For the first two rounds or until the spade is properly embedded, **3** removes the dial sight.)

2 attaches the lanyard and steps clear of the wheel.

3, 4 and **5** step clear and stand to attention facing the front.

When his turn arrives **1** glances at the breech and orders "Fire."

2 fires the gun, puts the lanyard round his neck, brings the gun to the loading position, opens the breech, ejects the tube and wipes the head of the vent axial with a wet cloth.

The gun is re-loaded and re-laid.

The gun will on no account be fired without the order from **1**.

19. MISSFIRES.

If the gun fails to fire, 2 re-attaches the lanyard and pulls it. If the gun again fails to fire, 2 allows ten seconds to elapse, ejects the tube and examines it.

If the tube has failed to fire he examines the cap. If not fairly struck the lock is changed. If fairly struck a new tube is inserted. This tube is also tried twice; if it fails a second time, a pause of ten seconds is made and the lock is changed.

If the tube has fired a pause of three minutes is made; 1 then depresses the gun with the elevating hand-wheel until 2 can open the breech; after a further pause of one minute 1 removes and examines the cartridge. If it is dry and serviceable, 1 re-adjusts it in the chamber. If it is damp or smouldering, he places it clear and orders a new cartridge to be loaded.

None of the detachment nor cartridges should be in rear of the breech when it is opened.

20. TO CLEAR THE SPADE.

Section commander.

"... section—*Spades clear.*"

1 orders "With dragropes, run up."

4 and 5 make fast wheel purchases just above the brake blocks and take off the brakes.

All numbers except 1 and 3 man the ropes, even numbers on the right, odd numbers on the left.

At the order from **1** the gun is run to the front until the spade is just clear.

1 orders "Take post"; **6** and **7** replace dragropes and clear the earth from the spade.

21. TO CHANGE TARGET.

Section commander.

"... section—*Change target,*"

"... *degs. ... mins. more right (or left),*"

or

"... *degs. ... mins. right (or left) of zero lines.*"

1 clears the spade if necessary, orders "Take post to lay" and directs the gun into the approximate line.

1 sets the elevation indicator at 20 degrees and the sight clinometer at zero, and levels the clinometer bubble.

2 closes the breech and brings the gun to the firing position.

3 sets the traversing gear at zero. If the angle is given as "more right (or left)" he sets the dial sight at the recorded present target angle; if the angle is given from zero lines he sets the dial sight at the recorded zero line angle. He then turns the micrometer head of the dial sight through the angle ordered.

1 passes the reading to his section commander who corrects it if necessary.

The procedure is then as in Section 11. "To lay the gun in the line of fire."

22. TO STOP FIRING.

Section commander.

"... section—*Stop.*"

The detachment continue their duties but the gun is not fired until the order "Go on" is given.

23. TO STAND FAST.

Section commander.

"... *section—Stand fast.*"

All stand fast whatever they are doing.

At the order "Go on" work is continued.

24. TO STOP LOADING.

Section commander.

"... *section—Stop loading.*"

The detachment continue their duties. Any gun already loaded is fired at its proper interval, but no gun will be loaded until the order "Go on" is given.

25. TO EMPTY GUNS.

Section commander.

"... *section—Empty guns.*"

Any gun loaded is laid at the last elevation and line, and fired.

If a safety pin or cap has been removed before the order is given, the loading is completed and the gun fired.

26. TO STAND EASY IN ACTION.

Section commander.

"... *section (or No. ...)—Stand easy.*"

This order is given to indicate that firing is temporarily suspended.

Before opening fire again the order "Take post" will be given.

27. TO CEASE FIRING.

Before "Cease firing" is ordered guns must be empty.

Section commander.

"... section—Empty guns, Cease firing."

The spade is cleared.

2 closes the breech.

3 sets the traversing gear at zero, removes the No. 7 dial sight and sight clinometer and places them in their cases.

4 and 5 take off the brakes and place the cradle clamp in position.

2 elevates by the quick elevating gear until the cradle slides rest on the cradle clamp, 4 and 5 key up.

6 brings in the aiming posts if ordered.

All stores carried on the carriage are secured in position by the numbers responsible.

28. TO LIMBER UP.

Rear limber up.

Section commander.

"... section—Rear limber up."

The detachment take post as follows:—

2, 4 and 6 on the right of the trail, 1, 3, 5 and 7 on the left of the trail, kneeling with their backs to the axletree, highest numbers nearest the trail-eye; 8, 9 and 10 at the ammunition or, if manhandling, at the limber.

The limber is brought up, and when it is in the correct position, 1 orders "Halt, limber up."

2 and 3 go to the limber wheels, 4 and 5 to the trail, 6 and 7 to the limber hook.

1 orders "Lift" and the trail is lifted.

1 orders "Lower" and the trail eye is lowered on to the limber hook; 7 keys up.

All stores carried on the limber or in the limber box are placed in position by the numbers responsible.

The detachment form detachment rear.

Right, Left or Front limber up.

6 makes fast a dragrope to the trail eye; the trail is moved round to the required position and the procedure is then as in rear limber up.

29. CASUALTIES TO DETACHMENTS.

Men sent up to replace casualties report to their section commanders who order such changes of duties as they consider necessary.

Casualties are replaced as follows:—

Section commander ... By the senior No. 1 of the section.

1 ... By a named successor (usually 10).

3 ... By a named successor.

With nine men ... 2 performs the duties of 2 and 4.

With eight men ... 2 performs the duties of 2 and 4; 10 performs the duties of 10 and 6.

With seven men ... 1 performs the duties of 1 and 3; 2 performs the duties of 2 and 4; 10 performs the duties of 10 and 6.

30. DISABLEMENT.

The extent of disablement ordered will depend on the time available and the probability of recapture.

To disable the gun so that it can be brought into action immediately after recapture: Close the breech, remove the carrier hinge bolt and lever breech mechanism.

To disable the gun so that it can be brought into action after repair: Remove the piston rod nut and ram nut; place the gun at extreme left traverse; fire a round with full charge.

To destroy the gun: Place an H.E. shell in the muzzle; load with H.E. and full charge; fire the gun by means of a long lanyard from under cover. A length of telephone cable attached to the lanyard is suitable for the purpose.

NOTE:—The dial sight and clinometers should always be removed and taken away before abandoning a gun.

31. BLANK AMMUNITION.

(i) No officer, non-commissioned officer or gunner who has not been trained and passed in gun drill, is to command a section or form part of a gun detachment firing blank ammunition at salutes or at training.

(ii) When firing B.L. blank cartridges, no gun is to be reloaded within 30 seconds after firing. Even after this interval no gun is to be reloaded until the chamber and bore have been sponged out and examined by 1.

(iii) In the event of a missfire a further attempt should be made to fire the gun in its turn. In no case must the breech be opened for at least one minute with black powder and ten minutes with smokeless charges. No one must be in the rear of the breech when it is opened. In firing salutes, an officer or senior non-commissioned officer should be detailed for the special duty of timing the interval after a missfire and informing 1 of that gun when the breech may be opened.

CHAPTER III.

LAYING AND FUZE SETTING TESTS.

1. In every battery there should be at least six qualified layers per subsection, exclusive of serjeants and lance-serjeants. A list of layers should be kept. All layers, section commanders, serjeants and lance-serjeants should be tested periodically.
2. All officers and Nos. 1 must be thoroughly conversant with:—
 - (i) The tests for and care of sighting gear and sights.
 - (ii) The methods of obtaining parallel lines of fire.
 - (iii) The application of gun corrections.
3. Layers will be tested by means of two tests: Test A will consist of four lays indirect, test B of two lays direct.
4. A maximum of 20 marks will be given for each lay in test A, and 10 marks for each lay in test B. In order to qualify a layer must obtain 75 marks.
5. The examiner should be assisted by an officer or senior non-commissioned officer with a stop-watch and record book, and by a penciller who will take down all orders given, for reference when checking the lay.
6. When laying indirect three or more aiming points should be selected to the rear and on either flank, if possible, and made known to all concerned.
7. Before beginning the tests at least five targets will be

selected in the foreground at varying ranges and angles of sight, and covering a front of about 25 degrees; except in the case of targets representing guns these should be natural features of the ground. If it be necessary to use dummies they should be placed in positions such as the troops which they represent would naturally occupy on service. A reference point, approximately in the centre of the target zone, will be pointed out to the No. 1 and to the layer; targets will be indicated with reference to this point by means of the clock code.

8. When laying direct on any target (other than a gun target) which extends over a fairly wide frontage, great exactitude in direction will not be required as regards the point originally selected to lay upon, which may be anywhere in that portion of the target opposite to the gun being laid. Any subsequent lay on the same target must, however, be on the same point as the first.

9. The orders for the lay must be given out by the examiner clearly and distinctly, a short pause (about two or three seconds) being made after each separate order, thus: "*All guns, 20 degs. right*"—pause—" *All guns, 15 mins. more right*"—pause—" *Angle of sight, 1 deg. 20 mins. elevation*"—pause—" *20 degs. 20 mins.*"

All orders will be acknowledged by the No. 1 and acted on at once. Should the layer at any time be in doubt as to a particular order, he will refer to the No. 1, who may repeat to him any part of the order received. The No. 1 may, in turn, refer to the examiner.

10. After checking a lay, the examiner will elevate the gun about 15 minutes.

11. In the case of a change of target, the brakes must be taken off and put on again.

12. Layers will be examined in pairs (Nos. 1 and 3); for any incorrect part of a lay marks will be deducted only from the individual making the error.

13. The times allowed for each lay are as follows :—

Test A.				Test B.	
Lay 1. 1' 30"	Lay 2. 0' 35"	Lay 3. 1' 20"	Lay 4. 1' 40"	Lay 5. 0' 45"	Lay 6. 0' 25"

The layer will call out "Ready" as soon as he has finished laying the gun. The time will be taken from the conclusion of the orders for the lay until the word "Ready" from the layer.

14. One mark will be deducted :—

- (i) For every five seconds or fraction of five seconds beyond the time laid down for the particular lay.
- (ii) If the traversing gear is not within 30 minutes of zero except in lays in 2 and 6.
- (iii) For each mistake in the manipulation of the sighting gear or in the drill of the layer as laid down.

15. Two marks will be deducted :—

If the angle of sight has not been taken correctly when laying direct.

16. Ten marks will be deducted :—

If the aiming posts are not planted in line.

17. No marks will be given for the lay:—

- (i) If the sight is incorrectly set.
- (ii) When laying indirect, if the gun is not correctly laid for elevation and direction.
- (iii) When laying direct, if the gun is not laid for elevation within 3 minutes or for direction within 5 minutes.
- (iv) If the bubble of the cross level is not wholly visible.

EXAMPLES OF TESTS.

Laying tests.

The howitzer is placed on a firm platform. The examiner sets the elevation indicator at about 20 degrees and the remaining scales at zero.

Test A (indirect).

Orders.	Procedure.
Lay 1.	
“ <i>Aiming point,</i> ”	The procedure will be as laid down under “To lay the gun in the line of fire.”
“ <i>All guns, 90 degs. 10 min. right.</i> ”	The battery picket and auxiliary aiming point readings will be chalked up after 3 has reported “Ready.”
“ <i>Aiming posts front.</i> ”	The procedure will be as laid down under “To plant aiming posts.” Time for this part of the lay is not taken.

Test A (indirect)—*continued*.

Orders.	Procedure.
Lay 2.	
"Charge two."	The procedure will be as
"All guns, 1 deg. 10 mins. more right."	laid down under "To lay the gun."
"Angle of sight, 1 deg. 20 mins. elevation."	
"25 degs. 40 mins."	
Lay 3.	
"Change target."	The procedure will be as
"Charge three."	laid down under "To change target" and "To lay the gun."
"All guns, 2 degs. 15 mins. more left."	
"No. 3, 20 mins. more right."	The target auxiliary aiming
"Angle of sight, 10 mins. depression."	point reading will be chalked
"29 degs. 20 mins."	up after 1 has reported "Ready."
Lay 4.	
"Change target."	The procedure will be as
"All guns, 11 degs. 15 mins. right of zero lines."	laid down under "To change target" and "To lay the gun."
"Clinometer laying."	
"18 degs. 10 mins."	The target auxiliary aiming
	point reading will be chalked
	up after 1 has reported "Ready."

Test B (direct).

The reference point is described before orders are given.

Orders.	Procedure.
Lay 5.	
"Represent No. 3 gun in action."	The procedure will be as laid down under "To lay the gun."
"Infantry lining hedgerow, 4 o'clock, 3 degs. to 5 degs."	The bubble of the sight clinometer will be brought to the centre of its run before reporting "Ready."
"Open sights."	
"9 degs. 20 mins."	

The examiner will put on a deflection and note the reading.

Lay 6.	
"All guns, 40 mins. more left."	The gun will be re-laid on the same point of the target as in Lay 5.
"9 degs. 50 mins."	The deflection ordered will be such as will enable the layer to lay by means of the traversing gear.

Fuze setting test.

Orders.	Procedure.
"Fuze 9.3."	The competitor will set the fuses of six shell at the graduation ordered. Time, 1 min.

CHAPTER IV.—SIGHT TESTS.

The Watkin clinometer, sight clinometer and elevation indicator should be tested daily and after prolonged firing. The alignment tests should be carried out as often as possible.

The remaining tests (cross-levelling gear and parallel gear) should be carried out when required by a qualified artificer. These tests are given in the handbook.

Any adjustment to optical instruments must be carried out by a qualified artificer.

Test 1.—To test the Watkin clinometer.

Set the clinometer at zero, place it on the plane and elevate or depress the gun until the bubble is in the centre of its run. Turn the clinometer end for end; if the bubble is still in the centre of its run, the clinometer is in adjustment.

If the bubble is not in the centre, bring it so by means of the drum. One half the reading is the index error of the clinometer.

A correction for this index error must always be applied.

Test 2.—To test and adjust the sight clinometer.

With the sight clinometer bracket horizontal and the sight clinometer reading zero, the bubble of the sight clinometer should be in the centre of its run.

Place the sight clinometer set at zero in its bracket, and bring the bubble to the centre of its run by the elevating

handwheel. Reverse the sight clinometer end for end ; the bubble should still be in the centre of its run.

If the bubble is not in the centre, bring it so by turning the micrometer head. Note the reading and set the micrometer scales to half this reading. Bring the bubble to the centre of its run by the elevating handwheel. Slacken the nuts securing the micrometer scales and the screws securing the reader of the degree scale ; shift the micrometer scales and reader to zero and reclamp.

Test 3.—To test and adjust the elevation indicator.

With the sight clinometer reading zero and the bubble in the centre of its run, the elevation indicator should read the elevation at which the gun is laid.

Place a shell in the chamber to take up play in the elevating gear.

Cross-level the sight and set the sight clinometer at zero ; lay the gun at 20 degrees elevation with a Watkin clinometer ; bring the bubble of the sight clinometer to the centre of its run by the elevation indicator handwheel. The elevation indicator should read 20 degrees.

If the elevation indicator does not read 20 degrees, slacken the screws securing the retaining plate, revolve the skin until it reads 20 degrees and re-clamp.

Alignment tests.

Before beginning these tests the following preparations should be made :—

- (i) Place the carriage on a firm platform and manipulate until it is level transversely. (See iv.)
- (ii) Select a well-defined object at least 1,500 yards distant on which to lay.

- (iii) If this distant object cannot be found, set up the target testing sights (see diagram) about 50 yards in front (or in rear) of the gun at right angles to the axis of the bore.
- (iv) If the carriage cannot be levelled transversely the top of the dial sight carrier and the target testing sights should be sloped to the same angle as the carriage.
- (v) Fix cross wires at the muzzle of the gun.
- (vi) Set the elevation indicator and the cowl of the dial sight at zero; set the dial plate and micrometer scales of the dial sight and the deflection scale of the open sights at 25 minutes left deflection (true zero).

NOTE.—In practice, tests 4 and 5 are carried out simultaneously.

Test 4.—To test and adjust the dial sight and open sights for line.

The lines of sight through the dial sight and open sights should be parallel to the axis of the bore as regards line.

Lay the bore on the distant object for line by the traversing handwheel, using the intersection of the cross wires as a foresight and the axial vent as a hind sight. The lines of sight through the dial sight and the open sights should be on the distant object. When using the target testing sights, lay the bore on point B; the dial sight should be on point D and the open sights on point O.

If the dial sight is not in alignment, turn the micrometer heads of the dial sight until the line of sight is correct, slacken the screws securing the reader of the dial plate and the nuts

of the micrometers, shift the reader and micrometer scales to 25 minutes left deflection, and reclamp. If the open sights are not in alignment, turn the eccentric at the front vertical pivot of the rocking bar until the line of sight is correct.

Test 5.—To test and adjust the dial sight and open sights for elevation.

The lines of sight through the dial sight and open sights should be parallel to the axis of the bore as regards elevation when the elevation indicator is at zero.

Lay the bore on the distant object for elevation by the elevating handwheel. The lines of sight through the dial sight and open sights should be on the distant object. When using the target testing sights lay the bore on point B; the dial sight should be on point D and the open sights on point O.

If the dial sight is not in alignment, revolve the milled head at the top of the sight until the line of sight is correct, slacken the nut securing the micrometer collar, revolve the latter to zero and reclamp. If the open sights are not in alignment, slacken the clamping nut at the bottom of the foresight, screw the foresight up or down until the line of sight is correct and reclamp.

NOTE.—After adjusting the micrometer collar of the cowl of the dial sight the arrow on the view finder will not be opposite zero; if confusion is likely to arise this arrow should be erased and a new one scribed opposite the zero mark.

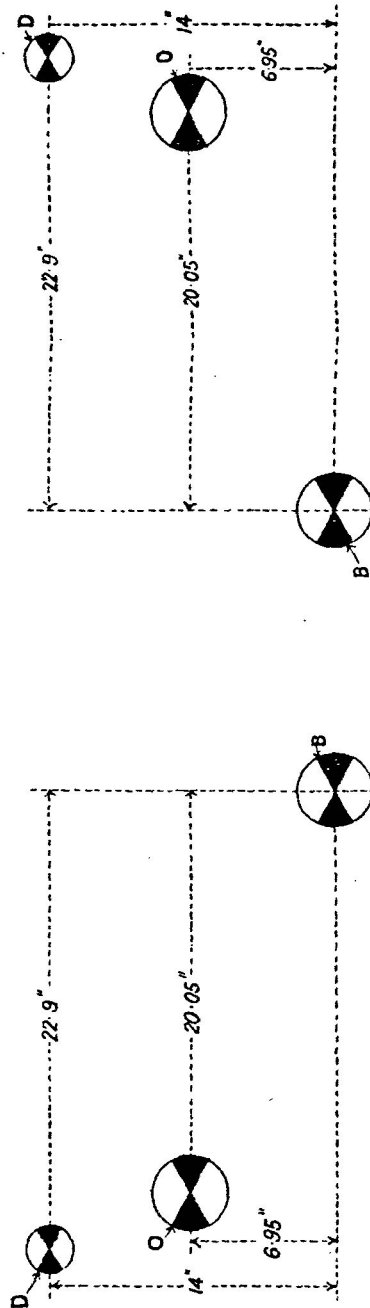
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TARGET TESTING SIGHTS.

6 IN. B.L. 26 CWT. HOW. MK.I. ON CARRIAGE MK.I.

FOR USE IN FRONT OF GUN.

FOR USE IN REAR OF GUN.



KEY
B - Bore of Gun
O - Open Sight
D - Dial Sight

CHAPTER V.—CARE OF EQUIPMENT.

1. CLEANING AND OILING.

Limber gunners should be intelligent and reliable men.

The projections on the exterior of the gun, which form guides for the latter when sliding in the cradle, should be kept clean and oiled and maintained in good working order; all working surfaces should be well lubricated and kept free from paint.

The bore should be kept clean and lightly greased. After firing, it should be scrubbed with caustic soda and hot water (one pound to a gallon), using the piasaba brush. When dry it should be lightly greased with mineral jelly.

Both plungers of the quick elevating gear should be kept well oiled with thin oil. The plungers, and the holes into which they fit, should be washed out occasionally with paraffin and re-lubricated.

No gritty substance, such as sand paper or bath brick, should be used for cleaning working surfaces.

All spare parts should be used periodically to ensure that they are in working order.

The axletrees should be greased frequently, the old grease, particularly from the channels of the pipe box, being removed before new grease is applied. If there is side-play between the wheel and the carriage, the linch pin should be withdrawn and the adjusting collar revolved to a suitable position to take up the play.

Heads of lubricators should be kept free from paint.

List of lubricators.

Fitting to be lubricated.	No.	Where situated.
Cradle	6	3 on each side for gun slide.
Capsquares	2	1 on each trunnion.
Quick elevating gear	5	2 on right plunger socket. 1 on left plunger socket. 1 on each side of cross shaft.
Elevating gear	3	Case, elevating gear.
Worm, 1.		
Spindle, worm, 1.		
Spurwheel, 1.		
Bracket supporting sight.	1	On top of bearing.
Elevating arc	1	On top of trunnion.
Brake gear	4	1 on each actuating rod. 1 on each actuating nut.
Cut-off gear		On cradle cap.
Saddle, pivot	2	Copper pipe in pivot.
Bearing, breech mechanism lever.	1	On top of carrier.
Safety shutter	1	On top left side of carrier
Carrier, hinge joint	1	On top of hinge pin.
Breech screw and pintle of carrier.	1	On top of breech screw.

2. THE ROCKING BAR SIGHT.

To avoid damage when travelling long distances, if the tactical situation permits, the sight bar and rocking bar sight complete are taken off by removing the front axis pin of the sight bar, and the split pins and collars of the rear axis pin of the sight bar and of the axis pin of the sight.

3. THE DIAL SIGHT AND CARRIER.

1. The No. 7 dial sight.

The dial sight when issued is in correct adjustment, water-tight, and with all the cells and joints secured with fixing screws.

It is very unlikely that the interior will require cleaning, and the dial sight must on no account be taken to pieces, except by a person in possession of an Ordnance College certificate stating that he is competent to do so.

The body of the dial sight should be cleaned with a clean soft cloth and a little oil, which must be rubbed off afterwards, care being taken that the glass is not touched. No gritty substance should be used.

The exteriors of eye lens and window should be cleaned with a chamois leather specially kept for the purpose. Great care must be taken that no oil or grease is allowed to touch the glasses. Fingers though apparently clean and dry leave marks on the lens which will impair the definition of the sight.

When not in use the dial sight in its carrier should be kept in its leather case on the left side of the saddle.

11. The No. 5 carrier.

If the sight is loose in the bracket it may be due to:—

- (a) The clamping screw head working out of its recess, making it impossible to clamp up. The remedy is to press the head into the recess and clamp.
- (b) The bracket being worn or strained, owing to working the sight about when taking it out of the bracket or over-straining the clamping lever. In this case a clamp to compress the bracket should be fitted if available; if not, one side of the bracket should be tapped lightly and evenly with a hammer by an artificer, with the clamping screw loosened.

4. THE BREECH MECHANISM.

1. General precautions.

The breech mechanism should be dismantled periodically in order that it may be thoroughly cleaned.

The threads of the breech screw should be free from burrs. Should the screw not work easily when the obturator has been detached, the defect may often be remedied by careful filing by an artificer, but no portion of the thread should be cut away to remove a crack.

The breech should be kept covered up when possible to prevent dust and grit getting into the breech fittings. A cover is provided for this purpose.

The obturating pad should be examined to see that the canvas covering is intact and in working order. If the canvas cover is found to be loose or to overlap either of the protecting discs, the obturator should be changed.

The spare pad should be kept under compression in the box obturator.

The protecting discs should be carefully examined and should be replaced if the steel rings are eroded, burred, or cracked.

When fitting the pad and discs on the axial vent, care must be taken that they are assembled in the correct order. The face of the pad marked "front" should be towards the muzzle. One or more steel adjusting discs may be required between the obturator and the face of the breech screw when the pad is compressed by firing, but the obturator should always turn freely.

The obturating pad should be a close fit in the coned seating of the chamber when the breech is closed. To ascertain this, lightly cover the seating with a mixture of oil and tallow; close and open the breech; the outer end of the pad should be covered with grease from contact with the greased seating of the chamber. If it is found that the pad does not fit the seating closely, adjusting discs should be added until the breech closes with some difficulty. The breech should then be opened and closed until it works easily. Before use, the pad and disc should be well covered with tallow.

Every opportunity should be taken to keep the obturator and axial vent cool. This can be done by pouring water over it in position, or by sousing it thoroughly with a sponge cloth during or after firing.

The obturator should never be dismantled when hot.

When a new pad is fitted, it must be expanded with a full charge.

ii. To dismantle the breech mechanism.

Before removing the mechanism the breech must be opened and the breech mechanism swung into the loading position.

Vent T axial and obturator:—Remove the keep pin from the pin retaining axial vent nut and withdraw the latter clear of the recesses in the axial vent nut. Unscrew the axial vent nut and remove it to the rear. Remove the spring vent axial. Withdraw the axial vent and obturator from the front end of the breech screw.

Breech screw:—Insert a screwdriver in the slot of the pin actuating retaining plate, press in the pin and partially revolve it by means of the screwdriver until the indicating arrow on the pin corresponds with the middle of the word "dismantle" on the breech screw. Withdraw the breech screw from the front end of the carrier.

Roller:—Remove the keep pin and roller axis pin, and withdraw the roller.

Lever breech mechanism:—Remove the keep pin and nut from the crankshaft and withdraw the breech mechanism lever.

Lever breech mechanism bearing, crankshaft and cross-head:—Remove the keep pin and securing screw of the breech mechanism lever bearing. Withdraw the bearing and crankshaft from the carrier. At the same time remove the crosshead from the inner end of the crankshaft from inside the carrier.

iii. To assemble the breech mechanism.

The breech mechanism is assembled in the reverse order.

iv. To dismantle the lock P.H. and slide box V.

To remove the lock and slide box:—Open the lock.

Remove the screw securing slide box. Unscrew the lock and slide box from the stem of the axial vent.

To remove the lock from the slide box:—Remove the axis pin of the extractor. Press down the knob of the plunger retaining cap until it is vertical and remove the lock and extractor from the slide box.

To dismantle or change the striker:—Remove the lock from the slide box. Unscrew the lever actuating lock with striker complete (left-handed thread). Remove the split pin of the striker cap and withdraw the cap. Withdraw the striker complete from the lever actuating lock. Unscrew the nut striker. Withdraw the rebound collar, mainspring and collar mainspring from the striker.

To dismantle the actuating lever:—Remove the split pin. Remove the pin guide retaining catch. Withdraw the plunger and spring.

v. To assemble the lock P.H. and slide box V.

The lock and slide box are assembled in the reverse order.

5. RECUPERATOR AND BUFFER.

General precautions.

i. Before firing :—

Care should be taken to see that the recuperator and buffer are correctly charged, that there is no leakage at the stuffing boxes or rear end of the liquid cylinders, that the isolating valve is open, that the cylinder block is firmly nutted up to the lug of the gun and the piston rod and ram to the front cradle cap, that the cut-off gear is in adjustment and that no split pins are missing.

It is necessary to strain the oil before charging the recuperator or buffer.

During severe weather, recuperators and buffers should be protected as much as possible from the cold.

Recuperator and buffer cylinders should be washed out with paraffin or hot water to remove grit as opportunities offer.

ii. In action :—

Fault.	Cause.	Remedy.
Incorrect length of recoil.	Cut-off gear out of adjustment.	Adjust by the sleeve.
Gun fails to run out.	Loss of pressure.	Pump up pressure, if necessary re-filling with liquid.
Gun runs out sluggishly.	Loss of pressure.	Pump up pressure.
	Excessive friction in the slides.	Clean and lubricate.
	Excessive friction in the stuffing boxes.	Repack the stuffing boxes.
Gun runs out violently.	Bent piston rod or recuperator ram.	Replace or straighten the bent rod.
	Throttle valve not working correctly.	Replace spring throttle valve.

If the buffer tank or pipe is damaged the isolating valve must be closed

iii. When guns are resting in action :—

Cool the bore. Allow air to escape from the buffer by the snifting valve. Replenish the buffer if necessary. Tighten packings if necessary. Test the air pressure after the gun has cooled.

6. THE RECUPERATOR.

i. General precautions :—

Before the front cradle cap is removed the gun must be secured to the cradle so as to prevent it from slipping back. This is done by putting a bar through the holes for the cradle clamp and wedging a block of wood between the bar and the gun.

If the cradle cap is to be left off for a long time, the elevating handwheel should be taken off.

ii. To charge the recuperator with liquid :—

Secure the gun to the cradle and level the cradle longitudinally and transversely with a clinometer. Disconnect the cut-off gear, piston rod and ram. Remove the cradle cap. Discharge any air pressure in the air chambers by removing plug F and opening the by-pass valve G. Remove the plugs from holes D, E and H.

Attach the pump connection and adapter at H and pump in oil until it overflows at D and E. Disconnect the pump connection and adapter, and replace the plug at H quickly to avoid losing oil. Replace the plugs in holes D and E.

Care should be taken to see that the recuperator is correctly charged as too much oil will cause serious damage and put the gun out of action. When correctly charged it should contain 28 pints of oil.

iii. To charge the recuperator with air :—

Before charging the recuperator with air, it is important to see that the securing collar is in the correct position on the recuperator ram, in order to prevent the ram from being forced out to the rear when under pressure.

Attach the air pump to the brackets on the trail. Remove plug F and attach the adapter and pressure gauge; connect the pump pipe to the adapter. Slacken the locking nut, open the by-pass valve G and pump until the gauge registers 610 lbs. per sq. in. Close valve G, disconnect the pipe from the adapter and place the cap on the adapter. Let the pressure down slowly to 600 lbs. per sq. in. by opening valve G slightly and slacking back the cap on the adapter. When the pressure reads 600, close valve G, tighten the locking nut, remove the adapter with pressure gauge and replace plug F.

iv. To test the air pressure :—

Remove plug F and attach the adapter and pressure gauge. Blank the outer end of the adapter with the cap. Slacken the locking nut, open valve G and the gauge should register 600 lbs. per sq. in.

If the pressure is correct, close valve G, tighten the locking nut, remove the adapter and gauge and replace plug F. If the pressure is not correct, close valve G, connect up the air pump and make up the pressure to 600 lbs.

Loss of pressure may be due to faulty rubbers; if the fault is in the stuffing box oil will leak over the ram; if on the head of the ram, oil will leak from the perforated cap in rear.

v. To replenish air pressure lost by leakage :—

Proceed as for charging the recuperator with air, but, before opening valve G to admit air to the recuperator, pump the pressure in the pipe up to 600 lbs. per sq. in.

If the air pressure falls below 450 lbs. discharge the air pressure and check the amount of liquid in the recuperator by removing plugs D and E and levelling the cradle.

vi. To empty the recuperator :—

Secure the gun to the cradle, disconnect the cut-off gear, piston rod and ram, and remove the cradle cap. Discharge the air pressure by removing plug F and opening valve G. Remove the recuperator stuffing box and plug H, and run off the oil. Lift the trail and rock the cradle up and down to ensure the complete emptying of the recuperator passage.

vii. To replace the ram packing :—

Secure the gun to the cradle, disconnect the cut-off gear, piston rod and ram and remove the cradle cap. Discharge the air pressure and remove the securing collar of the ram. Attach to the gun a hauling rope to the rear and a check rope to the front. Empty the liquid from the recuperator, remove the attachment between the gun and the cradle and haul the gun and recuperator body to the rear until the rear closing cap is clear of the cradle. Close the isolating valve and disconnect the copper pipe from the isolating valve and buffer. Remove the split-pin and cap, force the ram out from front to rear and remove it. Make fast the check rope, remove the packing, insert fresh packing and re-assemble the various parts. Re-charge the recuperator.

viii. To renew the hemp packing in the recuperator gland and the L leather or rubber in the recuperator stuffing box :—

These operations are similar to those in section 7 (iv) and (v) below, except that the air must be discharged before removing the securing collar from the ram.

7. THE BUFFER.

i. To fill the buffer :—

Remove the filling hole plug in the top of the tank, see that the isolating valve is open and elevate the gun about 5 degrees. Press in the snifting valve and pour oil into the tank until it overflows at the snifting valve. Release the snifting valve, fill the tank and replace the filling hole plug. About 23 pints of oil are required to fill the buffer and tank.

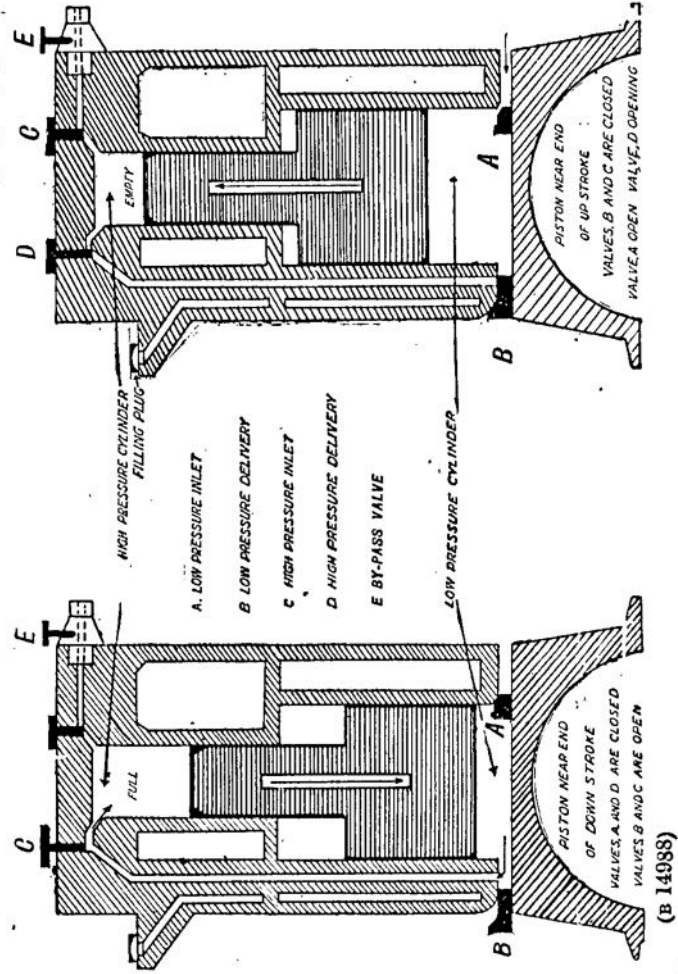
ii. To empty the buffer :—

Lay the gun horizontal, secure it to the cradle and disconnect the cut-off gear, piston rod and ram. Remove the cradle cap and unscrew the stuffing box. Run the oil off into suitable vessels. Replace the cradle cap and reassemble.

iii. To tighten the packing cap :—

Lay the gun horizontal, secure it to the cradle and disconnect the cut-off gear, piston rod and ram. Remove the cradle cap and tighten the packing cap by means of the spanner provided. Replace the cradle cap and re-assemble.

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iv. To renew the hemp packing in the buffer gland :—

Elevate the gun to a convenient position, secure it to the cradle and disconnect the cut-off gear, piston rod and ram. Close the isolating valve. Remove the cradle cap, unscrew the packing cap, remove the spring, sleeve and defective packing, and renew. Replace the sleeve, spring and packing cap, replace the cradle cap and re-assemble.

v. To renew the L leather or rubber in the stuffing box :—

Elevate the gun to a convenient position, secure to the cradle and disconnect the cut-off gear, piston rod and ram. Close the isolating valve. Remove the cradle cap. Remove the packing cap and spring, and unscrew the stuffing box together with the defective packing. Renew the packing. Replace the stuffing box, spring and packing cap. Refill the buffer, replace the cradle cap and re-assemble.

8. THE AIR PUMP.

A dust cover and two lifting bars are provided with the pump. The cover must be kept on when the pump is not in use.

The water jacket must be kept filled when the pump is in action. In cold weather empty the jacket immediately after action and close valve A to prevent dirt and grit entering the cylinder when standing. Open again when putting the pump into action and set the sight feed lubricator to give eight drips per minute.

Before charging the recuperator it is advisable to test the pump system as follows : Close the air charging valve of the

recuperator. Work the pump slowly until the gauge registers 600 lbs. per square inch. If the system is in good working order the gauge hand should remain stationary, or only creep back very slowly. Should the hand fall back quickly the system should be examined for external faults. Faults may be located by smearing wheel grease over the joints; air bubbles will be observed where there is a leak.

Great care should be exercised in using the gauge. When taking or releasing pressure the valve should be opened gently, in order to prevent damage to the gauge.

If the pump only gives 20 lbs. pressure, valves B and C are faulty. If the pump only gives 200 lbs. pressure valve D is faulty. If no air is delivered valve A is faulty. If the valves are proved to be in order, look to the packing rings of the piston. In the event of valve D going out of order, and no spares being available, replace it with valve B; valve C should not be used for this purpose.

If necessary the valves should be lightly ground in and coated with thin oil.

9. DISMOUNTING AND MOVING THE GUN.

i. To dismount the gun by rollers :—

Stores required.

Picks	...	...	...	1	Skids, 6-in. by 9-in.	...	1
Shovels	...	...	...	1	„ 4-in. by 5-in.	...	1
Iron-shod levers	...	...	...	2	Rollers, 3 ft. by 6-in.	...	2
Handspikes	...	...	...	2	Dragropes, heavy pairs...	...	2
Planks, 10-ft.	...	...	...	1	Scotches	...	4
„ 6-ft.	...	...	...	2	Sandbags	...	10
„ 4-ft.	...	...	...	1			

Men required, 10.

Sink the spade until the top is level with the ground. Lay the gun approximately horizontal longitudinally, put on the brakes and remove the breech mechanism, rocking-bar sight and cradle clamp. Place the small end of an iron-shod lever in the breech, leaving about 12 inches projecting; make fast the ends of two dragropes to the iron-shod lever as check ropes and take a turn with the other ends round each axletree arm inside the brake arm rods.

Disconnect and remove the front cradle cap.

Place the small end of an iron-shod lever in the muzzle, leaving about 12 inches projecting; make fast one end of a dragrope to the iron-shod lever; pass the dragrope over the top of the gun and hook another into the end of it. These dragropes are to be used as hauling ropes.

Place a 10-ft. plank on top of the trail in prolongation of the gun, one end resting on the top of a 4-ft. plank placed across the trail immediately in rear of the brackets of the cradle clamp, the other end supported on a 6-in. by 9-in. skid placed on its flat on the ground in rear of the trail eye. Place a 4-in. by 5-in. skid on its edge upon the trail under the 10-ft. plank to act as a support for the latter.

Put one man on each check rope in front of the axletree and the remainder on the hauling ropes. Elevate the gun to about 12 degrees; ease off on the check ropes and take in on the hauling ropes until the nuts securing the gun to the recoil arrangements are just clear of the cradle. Close the isolating valve and disconnect the copper pipe from the isolating valve and buffer. Disconnect the nuts, place the small ends of two handspikes against the projections for securing the gun to the recoil system, and push the system

up to the front. Hold the recoil system by replacing the front cradle cap and secure the latter by means of the recuperator ram nut.

Continue hauling the gun to the rear until a 3-ft. by 6-in. roller can be placed on top of the 10-ft. plank in front of the lug on the breech of the gun. Apply two handspikes as levers of the first order under the breech ring, in prolongation of the axis of the piece, using a 3-ft. by 6-in. roller as a fulcrum. Take the weight on the handspikes and elevate the gun until the breech rests on a 3-ft. by 6-in. roller in front of the lug.

Clear away the handspikes and fulcrum. Ease off on the check ropes until the breech roller is near the front end of the breech guide.

Great care must be taken at all times to see that no weight is taken on the dust excluders joining the breech and muzzle guides.

Apply the handspikes as described above and run the breech roller down to the breech end of the breech guide. Continue easing off on the check ropes until the front of the muzzle guide is within 1 in. of the rear end of the cradle.

Place a 3-ft. by 6-in. roller under the breech end of the muzzle guide, elevating or depressing the cradle as required by the elevating handwheel. After the first roller has been placed in position, No. 1 should take post at the elevating and traversing handwheels, and while the gun is still within the cradle guides he should see-saw the handwheels to prevent the guides seizing in the event of the roller not moving at right angles to a line parallel with the centre line of the cradle.

Continue easing off down the 10-ft. plank. Adjust the rollers by means of the handspikes as required, the breech

roller as already detailed, and the muzzle roller by applying the handspikes as levers of the second order under the muzzle with the 10-ft. plank roadway as a fulcrum.

When the breech is near the ground, make arrangements for removing the gun.

ii. To remove the gun with a lorry :—

If the local situation permits the lorry to be backed up to the trail of the gun, a similar arrangement to the above can be employed, with the exception that the trail should be raised and supported upon short skidding and the 10-ft. plank led direct into the lorry.

iii. To remove the gun with a limber :—

Place two 6-ft. planks parallel with the gun, their centres 6 feet apart; raise their front ends about 12 inches by means of filled sandbags or skidding placed in line with the centre of gravity of the gun; let the rear ends rest on the ground. Back the limber up the 6-ft. planks until the limber hook is about 14 inches in front of the centre of gravity of the gun, scotch the limber wheels and raise the pole to an angle of about 40 degrees. Make fast the limber hook to the gun by means of a dragrope with a clove hitch passed round the hook and the gun.

Cast off the check-ropes. Bear down on the limber pole and by means of a dragrope with a clove hitch lash the breech of the gun close up to the two centre futchels of the limber. Hook dragropes to the dragwashers of the limber, take the weight, unscotch the limber and ease off down the 6-ft. planks.

iv. To mount the gun.

The procedure is the reverse of that described in section 9 (i).

APPENDIX.

CARRIAGE OF STORES.

1. Stores carried on the carriage.

Article.	No.	Where carried.
Brush, piassaba	1	On top of trail with handspikes.
Can, lubricating, No. 9	1	On right side of trail.
Clinometer, sight	1	On left side of saddle.
Lever, iron-shod	2	On top of trail.
Handspikes, common 6-ft.	2	On top of trail.
Rammer	1	Inside right trail arm.
Rimers, vent	2	In pocket on right side of trail.
Sight, dial, No. 7, with carrier, No. 5	1	On left side of saddle.
Tray, loading	1	On top of trail.
Stave end, No. 17	1	Inside left trail arm.

2. Stores carried on the limber.

Article.	No.	Where carried.
Axe, felling	1	On rear of limber.
Axe, pick	1	Under limber.
Bar, supporting pole	1	On splinter bar.
Box, grease	1	Under limber, off side, rear.
Brush, water, carriage	1	Under limber, near side, front.
Can, lubricating, No. 3	1	Under limber, near side, rear.
Hook, bill	1	Under limber, off side, front.
Posts, aiming	2	On rear of limber, in straps for felling axe.
Rifles, in covers, in clips	2	On front of limber.
Ropes, drag, heavy, pairs... ..	1	On splinter bar.
Shovels	2	On sides of limber.
Swingletrees, No. 12.	4	On front plate, off side.
Stays, outrigger	2	On splinter bar.

3. Stores carried in limber box.

Article.	No.	Where carried.
Adapter, oil, filling ...	1	Loose.
" pressure gauge ...	1	Loose.
Bit, vent, 18-inch (or 17-inch) ...	1	In cleats, left lower compartment.
Box, obturator ...	1	In straps, right compartment.
Box, spare springs, washers, &c. ...	1	In recess, centre compartment.
Chalk for recording angles ...	—	In recess, centre compartment.
Clinometer, Watkin, large, in case ...	1	Loose.
Funnel, filling, hydraulic buffer ...	1	In cleats, centre compartment.
File, bastard, half-round 8 or 10-in. ...	1	Loose.
Fuze keys ...	3	Loose.
Gauge, pressure ...	2	In felt-lined cleats, right compartment.
Hammer, claw ...	1	Loose.
Lanyards, firing ...	2	Loose
Measure, hydraulic buffer, filling, No. 1 ...	1	In cleats, right compartment.
Pins, keep, split, sets ...	1	In tin box, loose.
Screwdrivers, G.S. 6-inch ...	1	In cleats, left compartment.
" 4-inch special ...	1	In cleats, left compartment.
Spanners, McMahon ...	1	Loose.
Spanner—		
No. 1 (plug, buffer, rear) ...	1	In cleats, left lower compartment.
No. 2 (nut, recuperator ram) ...	1	
No. 3 (nut, gland, and nut, pintle) ...	1	
No. 4 (nut, recuperator) ...	1	
No. 5 (nut, recuperator) ...	1	
No. 6 (cap. gland, recuperator) ...	1	
No. 8 (sights) ...	1	
No. 9 sights ...	1	
No. 10 (sights) ...	1	
No. 13 (box, stuffing) ...	1	
No. 14 (plug, overflow) ...	1	
No. 23 (nut, piston head) ...	1	
No. 93 (wheels) ...	1	
No. 189 (wheels) ...	1	
Spanner, box, No. 11. ...	1	
Spanner, box, No. 12. ...	1	

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B

Stores carried in limber box—*continued.*

Article.	No.	Where carried.
Tallow, Russian, for obturator, tins	--	Loose
Tube, pocket, with strap ...	1	Loose.
Tommy, special ...	1	Loose.
„ 10-inch ...	1	In cleats, left lower compartment.
Tool, withdrawing, split pins ...	1	Loose.
Waste ...	—	Loose.
Wrench, breech mechanism, No. 137 ...	1	In cleats, left lower compartment.
Wrench, breech mechanism, No. 139 ...	1	In cleats, left lower compartment.
Wrench, breech mechanism, No. 199 ...	1	In cleats, left lower compartment.
Buffer, hydraulic—		
Packings, sets ...	2	In tray
Rings, hemp packing ...	2	
Springs, gland ...	1	
Gear, elevating and loading—		
Springs, plunger (L.H.)...	1	
Springs, plunger (R.H.) ...	1	
Recuperator—		
Packings, sets ...	2	In tray
Packings, plaited hemp, for air valve spindle (in tin)...	1	
Rings, hemp packing ...	2	
Springs, gland ...	1	
Springs, piston ...	1	
Springs, piston, leather ...	1	
Springs, valve throttle ...	1	